CSIR NEWS

ISSN 0409-7467

A SEMI-MONTHLY HOUSE BULLETIN OF CSIR

VOL 31 NO 3 15 FEBRUARY 1981

Indo-USSR Seminar on Solar Energy

the end of the second Indo-USSR inar on Solar Energy, held at the tral Salt & Marine Chemicals search Institute (CSMCRI), avnagar, on 15-16 November 1980, a ft protocol on collaborative projects ween the two countries was drawn

The programme envisages: Preparation of selective surfaces for plate collectors and their field ting; (2) Development of 300 W rmoelectric generators coupled to table systems of concentrators; and Development of 500 W Stirling gine for power generation.

The USSR delegation consisted of Dr V. Tarnizhevsky (leader), of ENIN, oscow, and Dr (Mrs) I.I. Kokhova of NIN and Dr V.S. Truhov of Uzbek R Academy of Sciences, Tashkent. he Indian team, led by CSMCRI's rector Dr D.J. Mehta, consisted of Dr S. Rao, Dr S.D. Gomkale and Dr K. Sapre (CSMCRI); Prof. B.S. agal, Dr Y.K. Dange, Dr H.C. hariwal and Dr G.K. Sharma (Indian stitute of Technology, Bombay); and r G.D. Sootha and Dr S.K. Sharma lational Physical Laboratory, New elhi).

At the seminar the Indian side resented nine papers while the Soviet de presented three. Dr Tarnizhevsky resented a paper on selective surfaces nd reported the results obtained with ack nickel. The design and performance of a solar thermoelectric enerator of 100 W capacity was the bject of Dr (Mrs) Kokhova's paper. r Truhov's paper on the performance f 500 W solar operated Stirling engine was discussed at length. The USSR delegate presented the energy input and output analysis for the engine and explained the reasons for the low efficiencies.

Papers from India included five from CSMCRI, three from IIT (Bombay), and one from NPL. NPL and CSMCRI scientists presented their work on black nickel and aluminium anodized selected surfaces.

The USSR and Indian sides exchanged the samples of selective surfaces prepared by them for studying the environmental stability of the surfaces.

Scientists from CSMCRI presented the design and optical analysis of a multifaceted concentrator for the Stirling engine and a Winston cusp receiver with cylindricoparabolic concentrator for the solar thermoelectric generator. The IIT team presented thermodynamic analysis of the Stirling engine, status paper on their project on free piston Stirling engine, and a review on multicylinder Stirling engines and their applications. The performance and thermal analysis of the 0.25 hp Stirling engine and the design of tracking system for paraboloidal concentrators formed the subject matter of another paper from CSMCRI. □

Aerobiological Survey of Pollen and Fungal Spores: Workshop

A workshop to impart field training on collection and identification of pollen and to review the progress of work in the aerobiology project covering the centres in northern India was held at the CSIR Centre for Biochemicals (CCB), Delhi, from 24 to 26 November 1980. Investigators in charge and research fellows from 14 centres attended the workshop, which was inaugurated by Prof. A.S. Paintal, Director, V.P. Chest Institute, Delhi. A general review of the work in progress at the various centres in India was given by Dr P.K.K. Nair (National Botanical Research Institute, Lucknow) and Dr A.P. Joshi (Scientist in charge, CCB).

One of the sessions at which representatives from the various centres reviewed the progress of work done at their respective centres revealed that several new pollens had been identified. Among them may be mentioned *Abies*, *Cedrus*, *Cupressus* and other gymnosperms, *Quercus*, *Rumex*, *Juglans* and other members of the group Cupuliferae from the Himalayan region, and *Phoenix*, *Tectona*, *Acacia* spp., sal, *Delonix*, cultivated grasses like *Triticum* and *Oryza* and also oil crops like *Linum* and *Brassica*. The most predominant pollens in the Gangetic region have been found to be *Holoptelea* and some grasses like *Dichanthium*, *Sorghum* and *Saccharum*.

Several new fungi have also been identified from the air, particularly at the Amritsar centre.

Calling upon the investigators in charge to make mass collection of pollens from the dominant plants of the

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locality for the period January-March, the workshop decided that all the centres would provide at least 2-3 g of pollens for antigenic tests at CCB from among the new allergens identified on the basis of the atmospheric pollen and spore surveys made at the centres.

Apart from taking stock of the progress of work made so far, the workshop provided instructions on various aspects of aerobiology through lectures and practicals by experts in the subject. Prof. H.Y. Mohan Ram (Department of Botany, University of Delhi, Delhi) gave a lecture on 'Pollenization mechanism with particular reference to the *Anemophilus* and *Entomophilus* plants', which served to infuse new interest among the participants in making field investigations as a prerequisite to the analysis of the airborne pollen and spores.

Prof. R.S. Sandhu gave an instructional lecture followed. by demonstration on the principles and practice of identification of fungal spores, particularly the airborne ones. Dr Nair gave a talk on 'Pollen morphology and identification', which was followed by an examination of the pollen grains brought on slides from various centres.

Field trips for providing training in the mass collection of pollen grains were made so as to facilitate the collection of pollens from the various centres for supply to CCB for further research on pollen spore allergens. □

Workshop on R&D Management at CFRI

The CSIR's Centre for R&D Management conducted a workshop on R&D Management at the Central Fuel Research Institute (CFRI), Dhanbad, from 26 November to 5 December 1980. Important among the topics discussed by the workshop were: Science and society; Perspective of coal industry in the eighties; Problems and prospects of coal utilization R&D in India and developed countries; Organizational development and perspective; R&D project management; R&D project selection and planning; Cost-benefit analysis; Project cost estimation and project budgeting; Performance budgeting; Manpower planning; Performance appraisal; Goal setting and management by objectives; and R&D utilization and transfer of technology.

A panel discussed the perspective of coal industry and prospects and problems of coal utilization R&D in which the representatives of Coal India Limited, Bharat Heavy Electricals Ltd, Indian School of Mines and CFRI participated. Two papers on 'Problems and perspectives of coal utilization R&D in India and in developed countries' were also presented.

The workshop felt that there was a need for laying down a time-frame and the extent to which the gas and oil produced from coal would be required to play a role in India's economy. A comprehensive plan should be drawn up, the workshop recommended, for the development and adoption of technologies promoting conservation of coal. Technologies relating to oil agglomeration, selective preparation, coal dust injection, coal gas usage, etc. should be commercialized through a clear-cut time-frame. Besides, facilities should be created for proper blending of prime coking coal, medium coking coal and blendable coals. Processing of iron ore by techniques which lead to the utilization of inferior coal and coal wastes should be increasingly adopted.

The workshop suggested that low temperature carbonization (LTC) should not be pitted against the fuel forest programme, as the latter programme is directed only to meet rural energy needs whereas LTC technology is not only aimed at providing fuel but also laying down a basis for conversion of coal to valuable chemicals. LTC can contribute, along with briquetting and pelletization, to reducing substantially kerosene consumption in the domestic sector.

The workshop also identified priority areas where CFRI should devote greater attention, and these included: evaluation of burning characteristics of raw and beneficiated Indian coals industrial boilers and furnaces; researc on development of fluidized-bed boile and problems concerning operation an maintenance of boilers and furnaces.

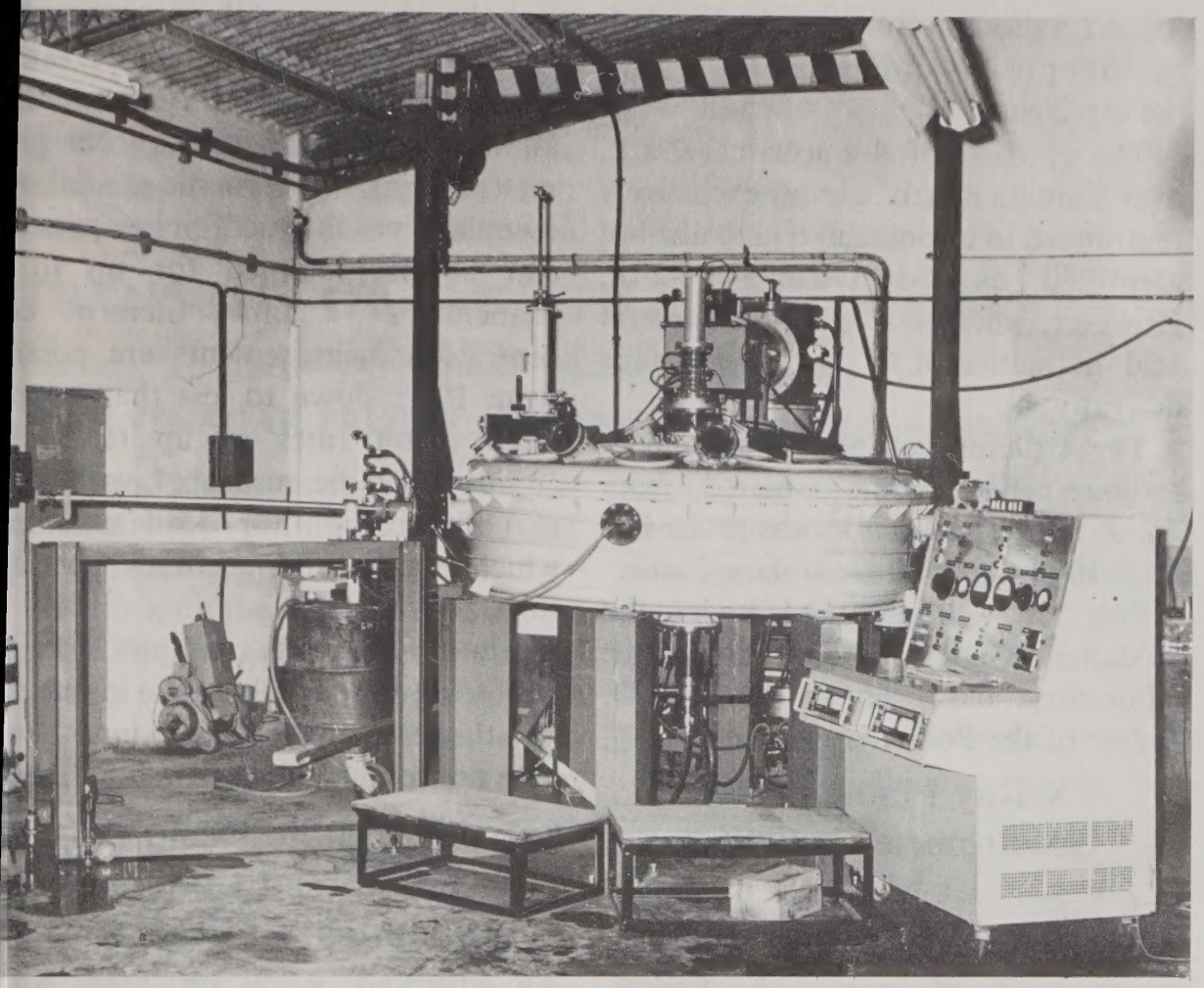
That policy on import of know-ho should be framed in such a way that th utilization of know-how availab indigenously is affected to the minimu extent was another of the workshop recommendations. Through yet anothe recommendation, the workshop urge that the planning of coal surve laboratories and manpower deploymen in the coal survey stations should b such that they do not get reduced t doing routine technical services for th coal industry only.

The workshop faculty was drawn besides the R&D Management Centre mainly from Administrative Staf College of India, Hyderabad; Indian Institute of Management, Calcutta Indian Institute of Public Administration, Delhi; and Management Development Institute Delhi. Forty-five CFRI personnel including project leaders and coordinators, and planning scientists, besides the house-keeping staff, took part in the workshop. □

Electron Beam Atomization Process

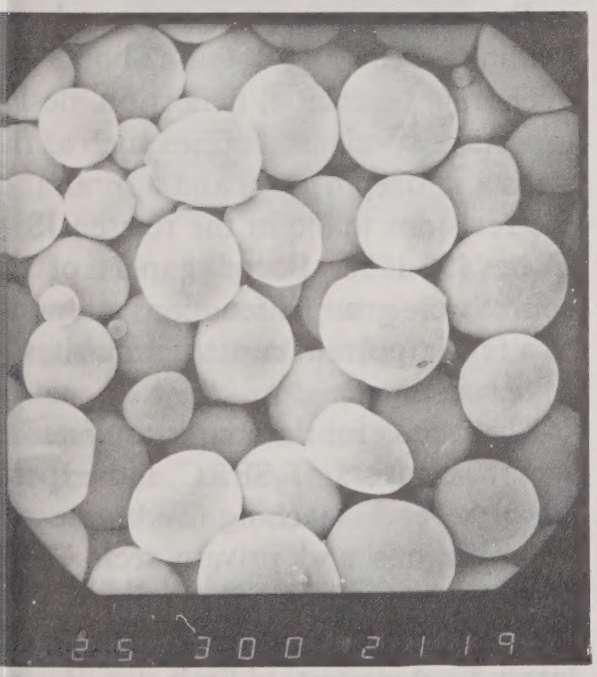
Under a project for developing and producing gas turbine components from titanium alloys through a powder metallurgy route, undertaken jointly by the National Aeronautical Laboratory (NAL), Bangalore, and the Defence Metallurgical Research Laboratory, Hyderabad, NAL has developed a process for atomization of titanium alloys. The process is capable of producing 10 kg alloy powder per day.

The processing of titanium alloys in conventionally forming the complex shapes of compressor discs and blades involves considerable machining which generates a large amount of scrap—as much as 84% of the starting material could be lost as scrap. Owing to the stringent purity requirements of titanium alloys for critical applications,



Stainless steel vacuum atomization chamber at NAL

he scrap generated cannot be easily ecycled. The cost of the finished roduct reflects the considerable scrap oss as well as the expensive machining nvolved. Also, the complex alloys when onventionally formed can show con- iderable segregation of the alloying lements leading to poor mechanical trength and reliability. These problems an be circumvented by developing a owder metallurgy route for processing these alloys to a final shape. However, the powder metallurgy route for titanium alloys is not easy to develop as the conventional atomization processes are not applicable to titanium alloys because of the extremely high reactivity of molten titanium. Centrifugal atomization in an inert atmosphere alone can provide powders of acceptable quality.



Titanium alloy powder produced by using rotating rod process at NAL

The NAL process consists in centrifugal atomization in vacuum off a rotating rod whose tip is continuously melted by an electron beam. The unit consists of a stainless steel chamber (2 m diam., 0.4 m height) that can be evacuated to a vacuum of 1×10^{-5} torr. At the bottom, within the chamber, the alloy rod to be atomized is held in a collet which can be rotated at speeds of up to 10,000 rpm. The collet is cooled by water through the hollow shaft. The top of the rod can be melted by means of a focused electron beam that gives a shallow pool of liquid metal contained on the top of the rod. On rotation, the liquid pool brakes up under the centrifugal force into droplets that fly off. These droplets solidify in flight as spherical particles and are collected at the bottom of the chamber. A sweep mechanism is provided by which the powder is swept through a discharge port into a collection can. The liquid droplets from the rotating rod are solidified within the chamber by means of water-cooled copper deflectors.

The NAL's rotating rod process does not require high-purity inert gases as needed in the rotating electrode process developed in USA and in the centrifugal shot casting process developed in UK. Also, the NAL process avoids deleterious tungsten pickup by employing electron beam melting. The high vacuum ensures clean, pore-free powder that will lead to good reliability in the formed components. The complete avoidance of exposure to air of the powder is built into the process. The size of the chamber is maintained within reasonable limits without resorting to cooling by any of the processes that can result in impurity pickup.

With a view to developing a viable powder metallurgy route for titanium alloy components, work is under way jointly with DMRL. DMRL is also studying consolidation of the powders through hot isostatic processing and hot explosive compaction. □

Natural Terpenoids and their Transformation Products

While analyzing the hexane extract of the leaves and stalks of the *Costus* plant and *Saussurea lappa* (Compositae), Shri P.P. Pai of the National Chemical Laboratory, Pune, has identified, in addition to the already reported taraxasterol and its acetate, three low melting esters: α-amyrin stearate, β-amyrin palmitate, and lupeol palmitate.

Shri Pai has also studied the transformation products of the compounds isolated. The oxidation of β-amyrene by Jones' chromic acid gave, in addition to β-amyrone (normal oxidation product) and β-amyrene-3,11-dione (allylic oxidation product), an oxido diketone to which the structure possessing an oxide bridge between C_9

and C_{13} and keto groups at C_3 and C_{11} has been assigned. Oxidation of β-amyrin acetate by the same reagent afforded in addition to 11-keto-β-amyrin acetate two new ketoacetates, identified as 3 β-acetoxy-$\Delta^{13(18)}$-β--amyrene-12-one and 3β-acetoxy-$\Delta^{18(19)}$-β-amyrene-12-one.

Taraxasterol, taraxasteryl acetate and taraxasterone, when oxidized with *m*-chloroperbenzoic acid gave the corresponding primary allylic alcohols, possessing the double bond between C_{20} and C_{21}, formed by the acid-catalyzed rearrangement of the initially formed epoxides, as the major products along with the corresponding C_{20}-norketones.

Jones' chromic acid oxidation of the above compounds gave, in addition to the C_{20}-norketones, the corresponding conjugated aldehydes, possessing the aldehyde function at C_{20} and double bond between C_{20} and C_{21}.

Selenium dioxide oxidation of taraxasterol and its acetate afforded the corresponding allylic oxidation products, with the oxygen function at C_{21} in addition to selenoxide.

Oxidation of (+)-car-3-ene with sodium dichromate and acetic acid gave: (i) 8-hydroxy-*m*-cymene, (ii) car-3-ene-2,5-dione, (iii) 1,1,4-trimethyl-cyclohepta-2,4-diene-6-one, and (iv) car-2-ene.

The epoxide of 4-α-acetylcar-2-ene, over alumina matrix, almost exclusively rearranged to a conjugated keto alcohol identified as 4-acetylcar-3-ene-2-ol. However, when treated with a mineral acid in methanol, it gave *p*-methane derivatives.

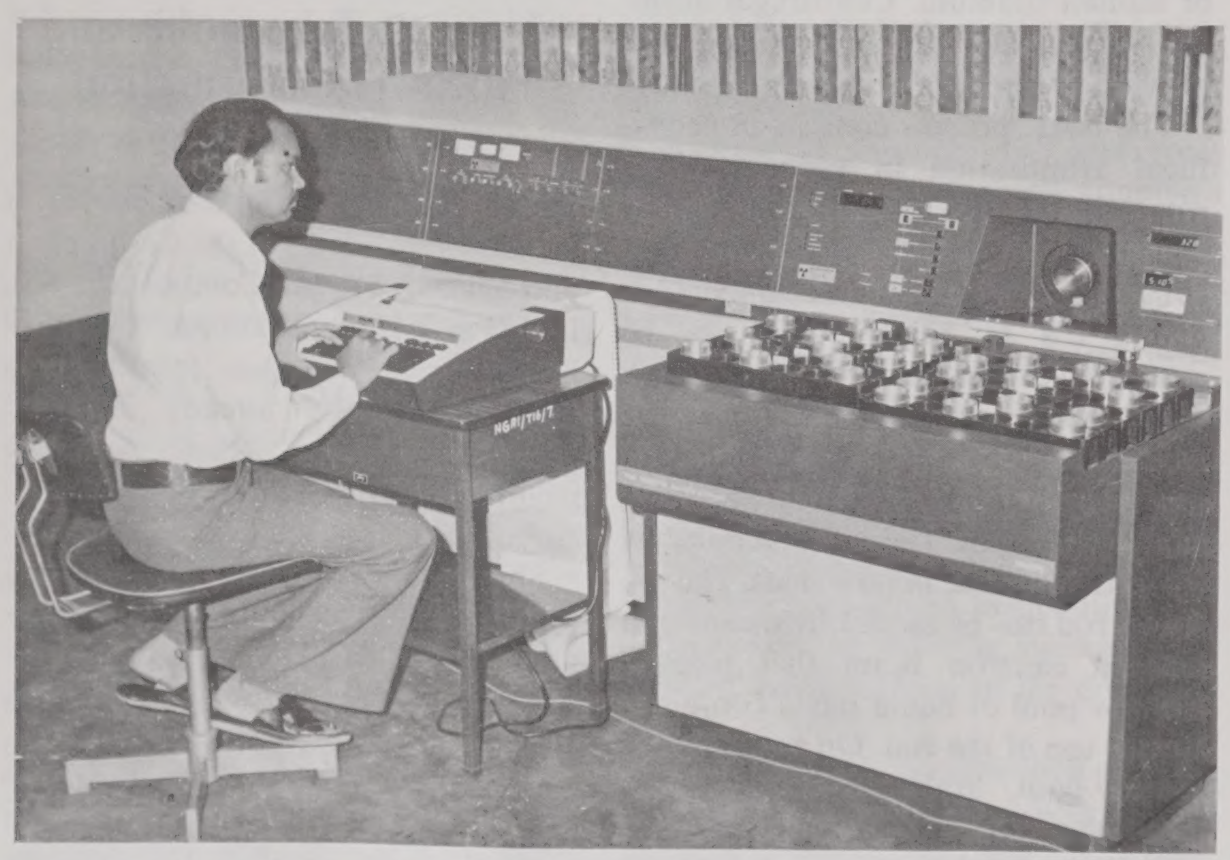
The structure of nardostachone, a sesquiterpenic ketone isolated from *Nardostachys jatamansi*, was revised as 1,8,9,10-tetradehydroaristolane-2-one.

Shri Pai, who worked under the guidance of Dr G.H. Kulkarni of the laboratory, has been awarded Ph.D. degree of the Poona University. □

X-Ray Fluorescence Spectrometer Installed at NGRI

A PW 1400 X-ray fluorescence spectrometer, procured from N.V. Philips, Holland, has been installed in the Geochemistry Division of the National Geophysical Research Institute, Hyderabad. The equipment is microprocessor-controlled and is attached to a mini computer, Philips P 851. It has the facility of 72-position sample changer with programma trays for fast and automatic sam handling. The microprocessor contr all the routine functions, from pa meter setting to automatic execution complete measurement programmes. can be programmed for up to elements at a time. Element co centration measurements are possib from 100% down to less than a ppr High count rates of up to 5×1 counts/s can be measured with aut matic correction for dead time los which enables high accuracy, special for trace elements.

About 100 rock samples can b analyzed (up to 63 elements) in one da and the results are obtained in the for of a printout. □



X-ray fluorescence spectrometer installed at NGRI

Limit State Design of Reinforced Concrete Structures: SERC Course

An advanced course on 'Limit Stat Design of Reinforced Concret Structures' was conducted by th Structural Engineering Research Centr (SERC), Madras, from 2 to 10 Januar 1981, for the benefit of senior an middle-level engineers. Forty-one engi neers, including one each from Iraq an Egypt, attended the course.

The course content included prin ciples of limit state design, inelasti analysis and design of structures, yield line analysis of slabs, analysis of section in flexure, compression, and combine loading, shear and torsion, bond an anchorage, cracking, deflection, desig aspects of special structures such as fla slabs and deep beams, and appraisal o the revisions made in the revised IS — Code: 456-1978. Forming part of the course were group discussions and visits to a few important construction sites in Madras.

The faculty for the course consisted of senior scientists of SERC and experts from several teaching and research organizations and private sector construction agencies in the country. One guest lecturer from abroad spoke on the latest developments in limit state design concepts.

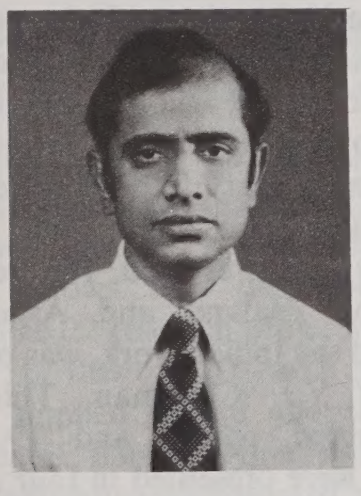
Inaugurating the course, Prof. P. valingam, Vice Chancellor, rarignar Anna University of chnology, Madras, emphasized the ed to adopt limit state design concepts r ensuring safety and serviceability of structures. Shri S. Vaiyapuri, Director of Technical Education, Madras, delivered the valedictory address and distributed certificates to the participants. □

TRENGTH OF MULTIPHASE ALLOYS AND POWDER METALLURGY

BHATNAGAR PRIZEWINNER DR ARUNACHALAM'S WORK*

Dr Arunachalam has made significant ontributions to both fundamental and pplied metallurgy.

His work on the CuAu ordered alloy emains the most comprehensive study f the mechanical behaviour and rdering processes in non-cubic uperlattices—the demonstration of the tress-ordering effect leading to 'ordered uperplasticity', his experiments show- ng the existence of a continuous rdering mechanism, the extension of rder-hardening theories to non-cubic uperstructures, and the atomistic mechanism he has proposed for the ormation of order twins, form the backbone of an understanding of neo- tructural order-disorder transfor- mations in metals.



A major portion of his research interests has been devoted to titanium and zirconium and he has carried out extensive work on mechanical proper- ties such as temperature dependence of yield stress, strain-rate sensitivity and rate-controlling processes in the defor- mation of titanium and zirconium alloys. However, the development of the rotating rod process for producing high-purity, spherical titanium powder by a group working under his guidance at the National Aeronautical Laboratory, Bangalore, must be considered his outstanding contribution to titanium metallurgy in India—especially because the only economic answer to titanium alloy processing for aeronautical appli- cations is the powder route. The process has now been commissioned on a pilot plant scale at NAL [*see* p. 18].

Dr Arunachalam's interest in the mechanical properties of materials has resulted in some very exciting work on the strength of two-phase materials. The mechanical properties of such alloys are dependent on the internal stresses in the material (due to the presence of a second phase) which may oppose the applied stress. He has shown how this 'back-stress' may be experimentally evaluated by stress-relaxation techniques. The use of the back-stress concept in explaining the strength of a thermomechanically processed, precipitation-hardened aluminium alloy has earned him the Binani Gold Medal of the Indian Institute of Metals. More recently he has extended the same concept in describing creep behaviour. His modified creep equation incorporating the back-stress helps to explain elegantly the anom- alously high values of stress exponent and activation energy observed in the creep of multiphase materials bringing their creep behaviour in line with that observed in all other single-phase metals and alloys. Subsequently, he has extended this analysis to include creep mechanisms for pore closure during hot isostatic pressing and in composite materials. His theory of pressure sintering is perhaps the only analytical treatment available to date which can explain all the experimental results.

A notable contribution in applied metallurgy is the development of brake-pad friction material through a powder metallurgy route under his supervision and guidance at DMRL, Hyderabad. Brake pads for aircraft based on this indigenous technology are now being mass-produced in a factory designed and commissioned under his guidance. In a single step this factory has freed the country from foreign dependence for this strategic item. A major production unit for the manufacture of armour piercing shots as an anti-tank ammu- nition is now being designed by Dr Arunachalam and his colleagues. These constitute outstanding and rare exa- mples of meaningful transfer of tech- nology from the laboratory to successful commercialization.

Dr Arunachalam had his early education at Chidambaram and studied at the universities of Mysore, Saugar, and Wales. He was selected as a trainee at the Atomic Energy Establishment and spent about ten years working as a scientist in the Metallurgy Division of the Bhabha Atomic Research Centre, Bombay. He later moved to NAL, where he was working in the Materials Science Division until 1975 when he took up the present assignment. He has been a Visiting Scientist at a number of foreign laboratories in Great Britain, Sweden, and USA.

Besides the Binani Gold Medal (1975), Dr Arunachalam has won the National Metallurgists' Day Award of the Union Ministry of Steel and Mines (1974). He is a fellow of the Institution of Metallurgists (London) and of the Indian Academy of Sciences. He is also on the editorial/advisory boards of *Journal of Materials Science* (Great Britain), *Journal of Scientific and Industrial Research*, *Bulletin of Materials Science*, and *Steel India*.

Dr Arunachalam is a member of the University Grants Commission, the

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*Dr V.S. Arunachalam, Director, Defence Metallurgical Research Laboratory, Hyderabad, has been named recipient of 1980 Shanti Swarup Bhatnagar Prize in engineering sciences [*CN*, 31 (1981), 1].

Science and Engineering Research Council (DST), and a director of the National Research Development Corporation of India. □

MATHEMATICAL GEOLOGY, SEDIMENTOLOGY AND DEPOSIT MODELLING

BHATNAGAR PRIZEWINNER PROF. SAHU'S WORK*

Prof. Sahu has made significant original contributions in several basic, applied, and interdisciplinary areas including clastic sedimentology, textural and structural properties, depositional environments, particle technology, stereology, porous media, and resource evaluation. He has utilized concepts from probability and measure theories, statistics, and topology for solving geological problems, especially by using multivariate and time series methods with the aid of computers.

He has successfully demonstrated that sophisticated multivariate approaches such as discriminant, cluster and factor models help in the accurate interpretation of grain-size statistics in terms of depositional processes and environments. These are now standard references in sedimentology and mathematical geology and are valuable for search and development of oil, gas, and mineral deposits.

Prof. Sahu has mathematically characterized the structural and textural properties of rocks and has solved the problems of optimal measurements procedures, normalizing transformations, and bias correction. He has clarified size interpretations by sieving, settling, thin-section, and loose-grain techniques.

He also solved reduction of the 'dimensionality' of a multivariate problem by determining the common factor space uniquely through the use of minimum variance of cumulative eigenvalue criterion in the system. He used this for interpreting the depositional processes and environments by the analyses of size and shape statistics.

His fundamental contributions to thin- and polished-section size studies are valuable in earth sciences as well as interdisciplinary fields such as stereology, particle technology, and porous media. These contributions help in estimating the porosity and permeability of rocks, characteristics which are valuable in oil production and assay of ores.

Prof. Sahu has studied the regional sedimentology and tectonics of Simla and Garhwal Himalaya and has also developed normalizing transformations for 'closed data' which will aid geochemical interpretations of chemical and modal anlayses of rocks and ores. He has significantly contributed to the search and evaluation of mineral deposits (chromites, iron ores) and has developed new stochastic models in time (spatial) domain for the estimation of reserves and grades, grade forecasts, etc. by using the computer. He is utilizing satellite data for earth resources evaluation.

A pioneer teacher in mathematical, statistical and computer applications in earth sciences, Prof. Sahu has conducted several courses at the University of Wisconsin; Indian Institute of Technology, Kharagpur; Indian Statistical Institute, Calcutta; and Presidency College, Calcutta. He has presented papers on earth sciences a on interdisciplinary areas in i ternational seminars.

Born on 19 February 1937 at Cuttac Prof. Sahu had his early education Christ Collegiate and Ravensha College. Receiving government schola ships during his studies at II Kharagpur, he earned with distinctio his B.Sc. (Hons) (1956) and M. Tec (1958) degrees. He was awarded th T.C.M. Fellowship for this doctor studies on sedimentology and pe roleum geology at the University Wisconsin, Madison (1958-1961). H has published over 85 paper. □

*Prof. B.K. Sahu, Professor of Geology, Department of Civil Engineering, Indian Institute of Technology, Bombay, has been named (jointly with Dr J.G. Negi) recipient of Shanti Swarup Bhatnagar Prize for 1980 in earth sciences. [*CN*, 31 (1981), 1].

Conference Briefs

International Workshop on Biosaline Research

On invitation from Mexico's Consej Nacional de Ciencia y Technologia, D E.R.R. Iyengar of the Central Salt & Marine Chemicals Research Institut (CSMCRI), Bhavnagar, attended th Second International Workshop o Biosaline Research held at La Paz Mexico, from 17 to 20 November 1980 The workshop, organized by th Indiana University with the support o the National Science Foundation (USA and Consejo Nacional de Ciencia y Technologia (Mexico), reviewed the biosaline activity in different countries regionwise and nine such regiona reviews were presented. The work done in New Zealand and Asia, which covered the Indian work, was presented by Dr V.J. Chapman. Thirty-three contributed papers and 19 invited papers were presented in four sessions Food & Economic Plants; Potential Use of Microalgae; Stress Biology; and Applications. The papers covered such aspects as the use of sea water for growing plants and crops, biocatalytic conversions, medicinals (marine fauna and flora), saline silviculture, de-salination, ocean farming (macroalgae), and pollutant and waste removal. Eleven countries, viz. Australia, Brazil, India, Israel, Kuwait, Mexico, New Zealand, Pakistan, Saudi Arabia, USA

d UK, participated in the workshop. his invited talk, Dr Iyengar gave an count of the work carried out in sea ter irriculture, and the scope and ture activities in the area of biosaline search in India.

He also visited the laboratory of ntro de Investigaciones Biologicas, a Paz, Baja California, and acquainted mself with the work being done on joba (*Simmondsia chinensis*). Also, siting the Los Angeles State and ounty Arboretum in USA, he acquain- d himself with the work done on uayule (*Parthenium argentatum*).

Deputation Briefs

r P.K. Govil of the National eophysical Research Institute, yderabad, was deputed to the etherlands during 14-30 September 980 to attend an application course on W 1400 X-ray fluorescence spectro- neter and spectrometry data handling y computer at N.V. Philips. After the ourse he had discussions with the cientists of Philips Holland on matrix ffect, background correction and ample preparation for geological amples. □

PROGRESS REPORTS

NBRI Annual Report: 1979

The annual report of the National Botanical Research Institute (NBRI), Lucknow, for 1979, brought out recently, shows that the laboratory investigated 22 research projects during the year; of these, 19 research projects were of applied nature and three of fundamental nature. Nine sponsored and collaborative/coordinated projects were also undertaken.

The work on introduction and acclimatization of non-traditional economic and rare ornamental plants made considerable progress. *Euphorbia tirucalli*, a promising petro-crop, *Parthenium argentatum*, a good source of natural rubber, and *Simmondsia chinensis*, a source of high class lubricant, were successfully introduced and brought under experimental cultivation. Agrotechnology for the cultivation of *Kallstroemia pubescens*, an alternative source of diosgenin, was worked out. Propagation of jojoba by tissue culture was being attempted. *Acacia coriacea*, a phyllodenous species of ornamental value, and two ornamental species of *Erythrina*, viz. *E. latissima* and *E. lysistemon*, were introduced from Western Australia and South Africa respectively.

Studies on Indian *Acacia* gums were continued. Detailed chemical studies on the interaction of xanthan gum with guar (*Cyamopsis tetragonoloba*) gum at different concentrations, temperatures and *p*H were carried out. It was observed that a 50% solution of guar gum afforded gels with the maximum gel strength, which, however, was much lower than the reported gel strength of carob gum.

Viscosity behaviour of a number of mucilaginous seeds of medicinal value available in the market was studied. These included the seeds of *Hygrophila auriculata* syn. *Asteracantha longifolia*, *Plantago lanceolata*, *Salvia plebeia*, and *Ocimum basilicum*. Several of these seeds were sent to the National Institute of Communicable Diseases, Delhi, for trials as insect repellents. Structure and development of a number of mucilage-, lipid-and protein-rich seeds were also studied.

Mimusops littoralis and *Acacia sinuata*, used by the tribals of Andaman and Nicobar Islands and Nilgiri Hills as fish bait and for killing lice in hair, were screened for useful constituents. Roots of *Albizia procera*, heartwood of *Melia birmanica* and leaves of *Holigrarna arnottiana*, which show pesticidal properties, were also subjected to systematic chemical analysis.

Pharmacognostic studies of five herbal drugs, viz. *Nymphaea stellata*, *Woodfordia fruticosa*, *Buchanania angustifolia*, *Rumex hastatus* and *R. nepalensis*, were undertaken.

Development/selection of high-yielding strains and their propagation by tissue culture of four medicinal plants, viz. *Dioscorea* spp., *Costus speciosus*, *Solanum myriacanthum* and *Trigonella foenum-graecum*, were attempted. Genetical and agronomical studies for increasing yield of morphine/codine in opium poppy were continued.

Studies were continued on the development of high-yielding strains, by genetical methods, of grain amaranths and sunflower.

Viral diseases of amaryllis, petunia and zinnia and fungal diseases of *Celosia*, chrysanthemum, coleus, cosmos and gladiolus were studied and investigations made to identify the respective causal organisms and to evolve control measures. Considerable progress was achieved on the cultivation of *Spirulina*, a protein-rich alga, in sewage for maximum utilization of solar energy.

Salt tolerance and cultural practices were studied for ashgourd, *Colocasia*, *Costus speciosus*, *Euphorbia tirucalli*, *Rumex* spp., *Scilla indica*, and winged bean. Agronomic investigations were also made on certain essential oil-bearing plants, viz. celery, *Cymbopogon*, German Chamomile, palmarosa and vetiver.

Pollen morphology of Rosales, having a bearing on its phylogeny, was studied. Germination and viability of the pollen of a number of pulse crops were also studied. A countrywide aero-palynological survey to determine and identify the allergenic pollen and spores occurring in the atmosphere has been started.

Following an ethnobotanical survey of nine villages of Kheri district of Uttar Pradesh, about 150 plant samples, used by scheduled tribes of Uttar Pradesh, were collected for identification and preparation of folklore inventories.

Field explorations and laboratory investigations were conducted to study the effects of atmospheric pollutants on the morphological features of certain plants with a view to determining the nature and extent of atmospheric pollution and to identifying pollution-resistant plants for cultivation in industrial and other polluted areas. A number of plants were found to be unaffected by such pollutants as sulphur

dioxide gas and carbon particulates.

An Economic Botany Information Service was set up at the institute in order to cater to the information needs in the fields of botanical, horticultural and phytochemical researches.

In all, 115 research papers were published and 15 research papers presented at seminars during the year; of these, 98 research papers pertained to applied research and 32 to basic research. □

PATENTS FILED

8/Del/80: A new pre-vacuumizer-cum-syruper for canned acid fruits, V. Nagaraju, A. Narayanaswamy & A. Chakravarty—MERADO, Madras.

100/Del/80: A process for the production of sodium chromate, D.N. Dey, S.C. Ray, A.R. Udupa & P.K. Jena—RRL, Bhubaneswar.

401/Del/80: An electrochemical process for the production of 3-nitro, 4-hydroxytoluene from *p*-nitrotoluene, H.V.K. Udupa, M.S. Venkatachalapathy, S. Chidambaram & B.K. Rao—CECRI, Karaikudi.

579/Del/80: A process for the manufacture of building blocks from lateritic soils, G.S. Ramaswamy, B.V. Subramanian, N.P. Rajamane & N. Balasubramanian—SERC, Madras.

581/Del/80: Catalyst and process for the conversion of alcohols to hydrocarbons, (Miss) S.B. Kulkarni, P. Ratnaswamy, I. Balakrishnan, B. Seshagiri Rao, (Mrs) A.J. Chandwadkar & A.N. Kotasthane—NCL, Pune.

599/Del/80: A process for the preparation of new yellow naphthoquino/quinazolinedione disperse dyes for polyester fibres, N.R. Ayyangar, R.J. Deshpande & D.R. Wagle—NCL, Pune.

619/Del/80: Improvements in or relating to immersion coppering of steel, B.A. Shenoi, S. John, N.V. Shanmugam, K.N. Srinivasan & M. Selvam—CECRI, Karaikudi.

623/Del/80: Improvements in or relating to black nickel plating of electroformed copper and nickel foils for solar applications, B.A. Shenoi, S. John, N.V. Shanmugham, K.N. Srinivasan & M. Selvam—CECRI, Karaikudi.

671/Del/80: Improvement in or relating to stain proofing of electroformed copper foils for printed circuit applications, B.A. Shenoi, S. John, N.V. Shanmugham, K.N. Srinivasan & M. Selvam—CECRI, Karaikudi.

732/Del/80: Catalyst and process for the alkylation of benzene to ethylbenzene, P. Ratnasamy, S.B. Kulkarni, V.P. Shiralkar, G.P. Babu & K.H. Chandayar—NCL, Pune.

773/Del/80: A digital set point proportional controller device, M.V. Subba Rao & V.R. Patil—CEERI, Pilani.

779/Del/80: A device to provide teleconference facility to subscribers on their telephone exchange, M.V. Subba Rao & R.S. Mahajan—CEERI, Pilani.

780/Del/80: Development of rust converting primer for protection of rusted steel structures, S. Guruviah, M. Sundaram, C. Rajagopal & K.S Rajagopalan—CECRI, Karaikudi.

781/Del/80: An improved process for activation of nickel electroforms, B.A. Shenoi, S. John, N.V. Shanmugham & M. Selvam—CECRI, Karaikudi.

828/Del/80: Improvements in or relating to the production of electrolytic-grade manganese dioxide from manganese salt solutions employing manganese dioxide coated titanium anodes, V. Aravamuthan, R. Srinivasan, S. Visvanathan, S.C.R. Chockalingam, S. Kulandaisamy, J.P. Rethinaraj, C.C. Gopalakrishnan & H.V.K. Udupa—CECRI, Karaikudi.

PERSONNEL NEWS

Appointments/Promotions

At the National Chemical Laboratory (NCL), Pune, the following have been appointed Scientist C: Dr Ravindra Tiwari (22 Sep. 1980), and Dr A.V. Shenoy (15 Oct. 1980).

Promotions, also at NCL, include those of Dr N.D. Ghatge (Scientist EII, 25 Sep. 1980) and Dr S.P. Vernekar (Scientist C, 14 Oct. 1980).

Shri T. Jagannathan has joined as Senior Finance and Accounts O on promotion and transfer from Central Electrochemical Rese Institute, Karaikudi (17 Nov. 1980

Shri P. Rajaram has joined NC Section Officer on promotion transfer from RRL, Hyderabad (10 1980).

Honours and Awards

For their paper 'A search for new arc chemicals: Structural modification citronellal (Part II)' published in *Ind Perfumer* [**23** (1), 1979], Drs V.K. Se K.L. Dhar, R.K. Thapa and C.K. Ata the Regional Research Laborato Jammu, have been awarded Dr D Dhingra Memorial Medal for the y 1979. The award, instituted by Essential Oil Association of India, is the best paper published in that journ The paper reports the synthesis of so useful and high-grade perfumery co pounds starting from citronellal, a che isolate from the oils of *Eucalyp citriodora* and Citronella.

Dr C.K. Atal

In recognition of his distinguish contributions in the pharmaceuti profession, Dr C.K. Atal, Direct Regional Research Laboratory, Jamm has been awarded Professor G Shrivastava Memorial Award (1980) the Association of Pharmaceutic Teachers of India, Nagpur.

Another honour which Dr Atal h received recently is the membership the editorial board of *Journal Ethnopharmacology*, Switzerland.

Retirements

Shri T.S. Visweswariah, Seni Finance and Accounts Officer, NC retired on superannuation (31 Oc 1980).

Patents Systems: Seminar

The national seminar on Paten Systems to have been held at th Regional Research Laboratory Hyderabad, from 25 to 27 Februar 1981 [*CN*, 30 (1980), 184] has bee postponed. The fresh dates will b announced.

Printed & Published by Y.R. Chadha, Chief Editor, Publications & Information Directorate (PID)
Hillside Road, New Delhi 110012, at PID Photocomposition-cum-Printing Unit
Editor: P.S. Shankar Assistant Editor: Dr B.C. Kashyap

RN 4212/